

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

Claim 1-30 (Cancelled).

31. (Currently Amended) A passive sampling device for ~~monitoring~~ accumulating over a period of time micropollutants ~~in~~ from an aquatic environment, which device comprises:

(a) a diffusion-limiting membrane contactable in use with the aquatic environment ~~to be monitored~~ and adapted to allow rate-limited diffusion therethrough of the micropollutants; and

(b) a receiving phase having a sufficiently high affinity for the micropollutants for ~~receiving and retaining~~ accumulating the micropollutants;

wherein the receiving phase is:

(i) a removable unitary element;

(ii) separated from the aquatic environment by said membrane;

(iii) comprised of a solid phase material immobilised by being bound in or to a hydrophobic solid support.

32. (Previously Presented) A device according to claim 31, wherein the solid support is in the form of a solid carrier for the solid phase material, which does not contain or retain water within its structure and can not exchange water with its

environment, whereby the solid support is not subject to loss of water and hence changes in dimension, due either to evaporation or osmotic efflux.

33. (Previously Presented) A device according to claim 31, wherein the diffusion-limiting membrane comprises a solid, hydrophobic material, which contains less than 1% water and/or is substantially non-porous, whereby the diffusion pathway comprises the solid polymer itself and not any water contained therein.

34. (Previously Presented) A device according to claim 31, wherein the diffusion-limiting membrane comprises polyethylene.

35. (Currently Amended) A device according to claim 31, suitable for ~~monitoring~~ accumulating polar, organic micropollutants, wherein the membrane is selected from polysulphone, polycarbonate, cellulose dialysis membrane, PTFE, PVDF and glass fibre.

36. (Currently Amended) A device according to claim 31, suitable for ~~monitoring~~ accumulating inorganic micropollutants, wherein the membrane is selected from cellulose acetate, glass fibre membranes, nylon membranes and dialysis membranes.

37. (Previously Presented) A device according to claim 31, wherein the diffusion-limiting membrane is or is associated with a molecular charge selective material.

38. (Previously Presented) A device according to claim 37, wherein the molecular charge selective material is selected from poly(4-vinylpyridine), poly(2,6-dimethylphenol) and perfluorinated polymers having pendant sulphonic acid groups.

39. (Previously Presented) A device according to claim 31, wherein the thickness of the membrane, and therefore diffusion pathway, is in the range of from 0.02 to 0.15 mm.

40. (Previously Presented) A device according to claim 39, wherein the thickness of the membrane, and therefore diffusion pathway, is less than 0.1 mm.

41. (Previously Presented) A device according to claim 31, wherein the thickness of the receiving phase is less than 1 mm.

42. (Previously Presented) A device according to claim 31, wherein the solid receiving phase is in the form of a cartridge or disk.

43. (Previously Presented) A device according to claim 31, wherein the immobilised solid phase material comprises C₈ to C₁₈ chain length hydrocarbon groups bonded in a silica-based polymer.

44. (Previously Presented) A device according to claim 31, wherein the solid support comprises a matrix of fibres.

45. (Previously Presented) A device according to claim 44, wherein the matrix of fibres comprises hydrophobic fibres.

46. (Previously Presented) A device according to claim 31, wherein a face of the membrane remote from the receiving phase is provided with netting or a mesh.

47. (Currently Amended) ~~A unit for use as a passive sampling device, which unit comprises a device according to claim 31, further comprising and an inert body adapted to allow insertion therein and removal therefrom of the solid receiving phase and~~ housing in which said receiving phase and said diffusion limiting membrane are removably mountable, said housing being adapted to allow access from the aqueous environment of the micropollutants to the membrane receiving phase through the diffusion limiting membrane.

48. (Currently Amended) A unit device according to claim 47, further comprising ~~provided with~~ removable means for enabling water or conditioning liquid to

be maintained in contact with the solid receiving phase between preparation and use of the device.

49. (Currently Amended) A device ~~unit~~ according to claim 48, wherein the ~~unit~~ housing and/or removable means comprise(s) PTFE.

50. (Currently Amended) A passive sampling method for monitoring over a period of time the concentrations of micropollutants in a polluted environment, which method comprises:

(a) providing a receiving phase having a sufficiently high affinity for the micropollutants for accumulating ~~receiving and retaining~~ the micropollutants, the receiving phase being a unitary element comprising a solid phase material immobilised by being bound in or to a hydrophobic solid support;

(b) providing a diffusion-limiting membrane adapted to allow rate-limited diffusion therethrough of the micropollutants;

(c) separating said receiving phase from said polluted environment using said membrane;

(d) bringing the membrane into contact with said polluted environment for a sufficient period of time to allow the micropollutants to ~~collect~~ accumulate in said receiving phase;

(e) removing said receiving phase from said polluted environment; and

(f) analysing the micropollutants accumulated in said receiving phase.

51. (Previously Presented) A method according to claim 50, wherein, in step (e), the solid receiving phase is removed from the environment and separated from the membrane.

52. (Previously Presented) A method according to claim 50, wherein the step (f) comprises applying extraction solvent to the receiving phase, whereby the micropollutants are removed from the receiving phase.

53. (Previously Presented) A method according to claim 52, wherein the extraction solvent is applied to one face of the receiving phase and is collected, containing the micropollutants, at the opposite face thereof.

54. (Previously Presented) A method according to claim 50, which further comprises pre-treating the receiving phase by coating it with the diffusion-limiting membrane; by conditioning it with a conditioner; or by loading it with internal standard; or any combination thereof.

55. (Currently Amended) A method according to claim 50, which further comprises pre-treating the receiving phase by treating it with an agent adapted to complex, chelate or otherwise assist the receiving phase to accumulate ~~receive and retain~~ the chosen micropollutant.

56. (Previously Presented) A method according to claim 50, which further comprises pre-treating the receiving phase by coating or impregnating it with a photometric agent selected from bathocuproine, methylthymol blue, xylenol orange, glycine cresol red, binchinonic acid and 1,5-diphenyl carbohydrazide.

57. (Previously Presented) A method according to claim 50, which further comprises pre-treating the receiving phase by coating or impregnating it with an internal standard comprising an isotopically-labelled compound, capable of, during deployment of the device, diffusing from the receiving phase through the diffusion-limiting membrane and into the aquatic environment at a known and controlled rate.

58. (Currently Amended) A passive sampling device for accumulating ~~monitoring~~ over a period of time ~~the concentrations of~~ non-polar, organic micropollutants ~~in from~~ an aquatic environment, which device comprises:

(a) a diffusion-limiting membrane contractable in use with the aquatic environment ~~to be monitored~~ and adapted to allow rate-limited diffusion therethrough of the micropollutants; and

(b) a receiving phase having a sufficiently high affinity for the micropollutants for accumulating ~~receiving and retaining~~ the micropollutants;

wherein the receiving phase is:

- (i) a removable unitary element;
- (ii) separated from the aquatic environment by said membrane;

(iii) comprised of a solid phase material immobilised by being bound in or to a hydrophobic solid support,

and wherein the diffusion-limiting membrane comprises a solid, hydrophobic polymeric material capable of determining the rate of diffusion of the micropollutants therethrough.

59. (Canceled)

60. (Previously Presented) A device according to claim 58, wherein the solid support is in the form of a solid carrier for the solid phase material, which does not contain or retain water within its structure and can not exchange water with its environment, whereby the solid support is not subject to loss of water and hence changes in dimension, due either to evaporation or osmotic efflux.

61. (Previously Presented) A device according to claim 58, wherein the diffusion-limiting membrane comprises a solid, hydrophobic material, which contains less than 1% water and/or is substantially non-porous, whereby the diffusion pathway comprises the solid polymer itself and not any water contained therein.

62. (Previously Presented) A device according to claim 58, wherein the diffusion-limiting membrane comprises polyethylene.

63. (Currently Amended) A device according to claim 58, suitable for accumulating ~~monitoring~~ polar, organic micropollutants, wherein the membrane is selected from polysulphone, polycarbonate, cellulose dialysis membrane, PTFE, PVDF and glass fibre.

64. (Currently Amended) A device according to claim 58, suitable for accumulating ~~monitoring~~ inorganic micropollutants, wherein the membrane is selected from cellulose acetate, glass fibre membranes, nylon membranes and dialysis membranes.

65. (Previously Presented) A device according to claim 58, wherein the diffusion-limiting membrane is or is associated with a molecular charge selective material.

66. (Previously Presented) A device according to claim 65, wherein the molecular charge selective material is selected from poly(4-vinylpyridine), poly(2,6-dimethylphenol) and perfluorinated polymers having pendant sulphonic acid groups.

67. (Previously Presented) A device according to claim 58, wherein the thickness of the membrane, and therefore diffusion pathway, is in the range of from 0.02 to 0.15 mm.

68. (Previously Presented) A device according to claim 67, wherein the thickness of the membrane, and therefore diffusion pathway, is less than 0.1 mm.

69. (Previously Presented) A device according to claim 58, wherein the thickness of the receiving phase is less than 1 mm.

70. (Previously Presented) A device according to claim 58, wherein the solid receiving phase is in the form of a cartridge or disk.

71. (Previously Presented) A device according to claim 58, wherein the immobilised solid phase material comprises C₈ to C₁₈ chain length hydrocarbon groups bonded in a silica-based polymer.

72. (Previously Presented) A device according to claim 58, wherein the solid support comprises a matrix of fibres.

73. (Previously Presented) A device according to claim 72, wherein the matrix of fibers comprises hydrophobic fibres.

74. (Previously Presented) A device according to claim 58, wherein a face of the membrane remote from the receiving phase is provided with netting or a mesh.

75. (Currently Amended) A ~~unit for use as a passive sampling device,~~
~~which unit comprises a device according to claim 58, further comprising and an inert~~
~~body adapted to allow insertion therein and removal therefrom of the solid receiving~~
~~phase and~~ housing in which said receiving phase and said diffusion limiting membrane
are removably mountable, said housing being adapted to allow access from the
~~aqueous environment of the~~ of micropollutants to the membrane receiving phase
through the diffusion limiting membrane.

76. (Currently Amended) A ~~unit~~ device according to claim 75, ~~provided~~
~~with~~ further comprising removable means for enabling water or conditioning liquid to be
maintained in contact with the solid receiving phase between preparation and use of the
device.

77. (Currently Amended) A ~~unit~~ device according to claim 75, wherein
the housing ~~unit~~ and/or removable means comprise(s) PTFE.

78. (Currently Amended) A passive sampling device for accumulating
~~monitoring over a period of time the concentrations of micropollutants from~~ in an aquatic
environment, which device comprises:

(a) a diffusion-limiting membrane contactable in use with the aquatic
environment ~~to be monitored~~ and adapted to allow rate-limited diffusion therethrough of
the micropollutants; and

(b) a receiving phase having a sufficiently high affinity for the micropollutants for accumulating ~~receiving and retaining~~ the micropollutants;

wherein the receiving phase is:

- (i) a removable unitary element;
- (ii) separated from the aquatic environment by said membrane;
- (iii) comprised of a solid phase material immobilised by being bound in or to a hydrophobic solid support,

and wherein the diffusion-limiting membrane comprises pores traversing the membrane in a direction substantially at right angles to the plane of the membrane and having a diameter in the range of from 0.1 to 10 μm .

79. (Canceled)

80. (Previously Presented) A device according to claim 78, wherein the solid support is in the form of a solid carrier for the solid phase material, which does not contain or retain water within its structure and can not exchange water with its environment, whereby the solid support is not subject to loss of water and hence changes in dimension, due either to evaporation or osmotic efflux.

81. (Previously Presented) A device according to claim 78, wherein the diffusion-limiting membrane comprises a solid, hydrophobic material, which contains less than 1% water and/or is substantially non-porous, whereby the diffusion pathway comprises the solid polymer itself and not any water contained therein.

82. (Currently Amended) A device according to claim 78, suitable for accumulating ~~monitoring~~ polar, organic micropollutants, wherein the membrane is selected from polysulphone, polycarbonate, cellulose dialysis membrane, PTFE, PVDF and glass fibre.

83. (Currently Amended) A device according to claim 78, suitable for accumulating ~~monitoring~~ inorganic micropollutants, wherein the membrane is selected from cellulose acetate, glass fibre membranes, nylon membranes and dialysis membranes.

84. (Previously Presented) A device according to claim 78, wherein the diffusion-limiting membrane is or is associated with molecular charge selective material.

85. (Previously Presented) A device according to claim 84, wherein the molecular charge selective material is selected from poly(4-vinylpyridine), poly(2,6-dimethylphenol) and perfluorinated polymers having pendant sulphonic acid groups.

86. (Previously Presented) A device according to claim 78, wherein the thickness of the membrane, and therefore diffusion pathway, is in the range of from 0.02 to 0.15 mm.

87. (Previously Presented) A device according to claim 86, wherein the thickness of the membrane, and therefore diffusion pathway, is less than 0.1 mm.

88. (Previously Presented) A device according to claim 78, wherein the thickness of the receiving phase is less than 1 mm.

89. (Previously Presented) A device according to claim 78, wherein the solid receiving phase is in the form of a cartridge or disk.

90. (Previously Presented) A device according to claim 78, wherein the immobilised solid phase material comprises C₈ to C₁₈ chain length hydrocarbon groups bonded in a silica-based polymer.

91. (Previously Presented) A device according to claim 78, wherein the solid support comprises a matrix of fibres.

92. (Previously Presented) A device according to claim 91, wherein the matrix of fibres comprises hydrophobic fibers.

93. (Previously Presented) A device according to claim 78, wherein a face of the membrane remote from the receiving phase is provided with netting or a mesh.

94. (Currently Amended) ~~A unit for use as a passive sampling device,~~
~~which unit comprises a device according to claim 78, further comprising and an inert~~
~~body adapted to allow insertion therein and removal therefrom of the solid receiving~~
~~phase and~~ housing in which said receiving phase and said diffusion limiting membrane
are removably mountable, said housing being adapted to allow access from the
~~aqueous environment of the~~ of micropollutants to the membrane receiving phase
through the diffusion limiting membrane.

95. (Currently Amended) A ~~unit~~ device according to claim 94, further
comprising ~~provided with~~ removable means for enabling water or conditioning liquid to
be maintained in contact with the solid receiving phase between preparation and use of
the device.

96. (Currently Amended) A ~~unit~~ device according to claim 95, wherein
the ~~unit~~ housing and/or removable means comprise(s) PTFE.

Claims 97 to 99 (Cancelled)

100. (Previously Presented) A device for monitoring micropollutants in an
aquatic environment, which device comprises:

(a) a diffusion-limiting membrane capable of being in contact with the
aqueous environment when the device is in use and adapted to allow rate-limited
diffusion therethrough of the micropollutants; and

(b) a receiving phase being separated from the aqueous environment by the membrane and having a sufficiently high affinity for the micropollutants for receiving and retaining the micropollutants;

wherein the receiving phase comprises an immobilised solid phase material supported by a solid support and wherein the diffusion-limiting membrane is or is associated with a molecular charge selective material selected from poly(4-vinylpyridine), poly(2,6-dimethylphenol) and perfluorinated polymers having pendant sulphonic acid groups.

Claims 101 to 104 (Cancelled)

105. (Previously Presented) A method for monitoring micropollutants in a polluted environment, which method comprises:

- (a) providing a receiving phase comprising an immobilised solid phase material for the micropollutants, which material is supported by a solid support;
- (b) providing a diffusion-limiting membrane adapted to allow rate-limited diffusion therethrough of the micropollutants and, in use, adapted to separate the receiving phase from the polluted environment;
- (c) bringing the membrane into contact with the polluted environment for a sufficient period of time to allow the micropollutants to collect in the immobilised solid phase material;
- (d) removing the solid receiving phase from the environment; and

(e) analysing the micropollutants accumulated in the receiving phase, which further comprises pre-treating the receiving phase by coating or impregnating it with a photometric agent selected from bathocuproine, methylthymol blue, xlenol orange, glycine cresol red, binchinonic acid and 1,5-diphenyl carbohydrazide.

Claims 106 to 108 (Cancelled)

109. (Previously Presented) A device for monitoring non-polar, organic micropollutants in an aquatic environment, which device comprises:

(a) a diffusion-limiting membrane capable of being in contact with the aqueous environment when the device is in use and adapted to allow rate-limited diffusion therethrough of the micropollutants; and

(b) a receiving phase being separated from the aqueous environment by the membrane and having a sufficiently high affinity for the micropollutants for receiving and retaining the micropollutants

wherein the receiving phase comprises an immobilised solid phase material and the diffusion-limiting membrane comprises a solid, hydrophobic polymeric material capable of determining rate of diffusion of the micropollutants therethrough which is or is associated with a molecular charge selective material selected from poly(4-vinylpyridine), poly(2,6-dimethylphenol) and perfluorinated polymers having pendant sulphonic acid groups.

Claim 110 (Cancelled)

111. (Previously Presented) A device suitable for monitoring inorganic micropollutants in an aquatic environment, which device comprises:

(a) a diffusion-limiting membrane capable of being in contact with the aqueous environment when the device is in use and adapted to allow rate-limited diffusion therethrough of the micropollutants; and

(b) a receiving phase being separated from the aqueous environment by the membrane and having a sufficiently high affinity for the micropollutants for receiving and retaining the micropollutants;

wherein the receiving phase comprises an immobilised solid phase material, and the diffusion-limiting membrane comprises pores traversing the membrane in a direction substantially at right angles to the plane of the membrane and having a diameter in the range of from 0.1 to 10 μm , and wherein the membrane is selected from cellulose acetate, glass fibre membranes, nylon membranes and dialysis membranes.

112. (Previously Presented) A device suitable for monitoring inorganic micropollutants in an aquatic environment, which device comprises:

(a) a diffusion-limiting membrane capable of being in contact with the aqueous environment when the device is in use and adapted to allow rate-limited diffusion therethrough of the micropollutants; and

(b) a receiving phase being separated from the aqueous environment by the membrane and having a sufficiently high affinity for the micropollutants for receiving and retaining the micropollutants;

wherein the receiving phase comprises an immobilised solid phase material, and the diffusion-limiting membrane comprises pores traversing the membrane in a direction substantially at right angles to the plane of the membrane and having a diameter in the range of from 0.1 to 10 μm , and wherein the diffusion-limiting membrane is or is associated with a molecular charge selective material selected from poly(4-vinylpyridine), poly(2,6-dimethylphenol) and perfluorinated polymers having pendant sulphonic acid groups.

Claim 113 (Cancelled)

114. (Currently Amended) A method of monitoring micropollutants in an aquatic environment, comprising:

- placing a passive sampling device in contact with the aquatic environment;
- ~~accumulating receiving and retaining~~, in the passive sampling device, a quantity of the micropollutants from the aquatic environment; and
- analyzing the quantity of micropollutants ~~retained by~~ accumulated in the passive sampling device;

wherein the passive sampling device includes:

- a hydrophobic support material;
- a solid phase material bound to the hydrophobic support material and configured with a sufficiently high affinity for the micropollutants in the aquatic environment to ~~receive and retain~~ accumulate the quantity of micropollutants; and

a diffusion-limiting membrane configured to separate the aquatic environment from the solid phase material and to allow rate-limited diffusion therethrough of the quantity of micropollutants.